

Claims

- [c1] 1. A control valve, comprising:
 - an elastomeric flow tube;
 - a plunger having first and second ends;
 - a pinch member connected to the first end of the plunger, the pinch member situated adjacent the flow tube;
 - a reference surface positioned generally opposite the pinch member such that the elastomeric tube is squeezable between the pinch member and the reference surface to control fluid flow through the flow tube;
 - a first guide spring situated between the pinch member and the first end of the plunger; and
 - a second guide spring situated adjacent the second end of the plunger.
- [c2] 2. The control valve of claim 1, further comprising an actuator receiving the plunger to adjust the plunger to selectively position the pinch member relative to the reference surface.
- [c3] 3. The control valve of claim 1, further comprising a plunger extension having first and second ends, the

plunger extension received by the plunger, the first end of the plunger extension extending from the first end of the plunger and abutting a first side of the first guide spring.

- [c4] 4. The control valve of claim 3, wherein the pinch member is attached to the first end of the plunger extension and is situated adjacent a second side of the first guide spring opposite the first side.
- [c5] 5. The control valve of claim 1, further comprising a plunger extension having first and second ends, the plunger extension received by the plunger, the second end of the plunger extension extending from the second end of the plunger and abutting a first side of the second guide spring.
- [c6] 6. The control valve of claim 1, wherein a damper is connected to the second end of the plunger.
- [c7] 7. The control valve of claim 6, wherein the damper includes a first member defining an opening therein and a second member slidably received in the opening such that there is clearance between the first and second members to create an air passage.
- [c8] 8. The control valve of claim 6, wherein the damper is situated adjacent a second side of the second guide

spring opposite a first side of the second guide spring.

- [c9] 9. The control valve of claim 5, further comprising:
 - a spring cup defining an opening therethrough;
 - a spring retainer having a first side adjacent an end of the spring cup opening and a second side and abutting a second side of the second guide spring opposite the first side of the second guide spring;
 - and
 - a preload spring received by the spring cup opening and seated in the spring retainer.
- [c10] 10. The control valve of claim 9, wherein the spring cup is attached to the second end of the plunger extension.
- [c11] 11. The control valve of claim 1, wherein the first guide spring comprises a flat disk defining a spiral slot therethrough.
- [c12] 12. The control valve of claim 1, wherein the second guide spring comprises a flat disk defining a spiral slot therethrough.
- [c13] 13. The control valve of claim 2, wherein the actuator includes a valve stem receiving the plunger.
- [c14] 14. The control valve of claim 13, wherein the first guide spring is clamped between a first end of the actuator and

a first end of the valve stem.

- [c15] 15. The control valve of claim 1, further comprising a pressure containing member situated about at least a portion of the flow tube.
- [c16] 16. The control valve of claim 15, wherein the pressure containing member comprises a braided sleeve.
- [c17] 17. The control valve of claim 15, wherein the pressure containing member comprises a plurality of rings.
- [c18] 18. The control valve of claim 15, wherein the pressure containing member comprises a rigid member receiving at least a portion of the flow tube.
- [c19] 19. The control valve of claim 18, wherein the rigid member comprises first and second members sandwiched about the flow tube.
- [c20] 20. A control valve, comprising:
 - an elastomeric flow tube;
 - a plunger having first and second ends;
 - a pinch member connected to the first end of the plunger, the pinch member situated adjacent the flow tube;
 - a reference surface positioned generally opposite the pinch member such that the elastomeric tube is

squeezable between the pinch member and the reference surface to control fluid flow through the flow tube; and

means situated at the first and second ends of the plunger for guiding the plunger.

- [c21] 21. The control valve of claim 20, further comprising means for containing the pressure of the flow tube.
- [c22] 22. The control valve of claim 20, further comprising means for damping oscillations of the plunger.
- [c23] 23. A flow measurement and control device, comprising:
 - an enclosure;
 - a flow measurement device situated in the enclosure;
 - an elastomeric flow tube in fluid communication with the flow measurement device;
 - a plunger having first and second ends;
 - a pinch member connected to the first end of the plunger, the pinch member situated adjacent the flow tube;
 - a reference surface positioned generally opposite the pinch member such that the elastomeric tube is squeezable between the pinch member and the reference surface to control fluid flow through the flow tube;
 - a first guide spring situated between the pinch mem-

ber and the first end of the plunger; and a second guide spring situated adjacent the second end of the plunger.

- [c24] 24. The flow measurement and control device of claim 23, wherein the flow measurement device is a Coriolis mass flow measurement device.
- [c25] 25. The flow measurement and control device of claim 23, further comprising:
 - an actuator receiving the plunger to adjust the plunger to selectively position the pinch member relative to the reference surface; and
 - a controller receiving a measurement output signal from the flow measurement device, the controller providing a control output signal to the pinch valve actuator in response to a setpoint signal and the measurement output signal.
- [c26] 26. The flow measurement and control device of claim 23, wherein the elastomeric flow tube, the plunger, the pinch member, the reference surface, and the first and second guide tubes are situated in the enclosure.
- [c27] 27. The flow measurement and control device of claim 23, further comprising a damper connected to the second end of the plunger.

[c28] 28. The flow measurement and control device of claim 23, further comprising a pressure containing member situated about at least a portion of the flow tube.